Do therapeutic imagery practices affect physiological and emotional indicators of threat in high self-critics?

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Abstract

Objectives: Imagery is known to be a powerful means of stimulating various physiological processes and is increasingly used within standard psychological therapies. Compassion-focused imagery (CFI) has been used to stimulate affiliative emotion in people with mental health problems. However, evidence suggests that self-critical individuals may have particular difficulties in this domain with single trials. The aim of the present study was to further investigate the role of self-criticism in responsiveness to CFI by specifically pre-selecting participants based upon trait self-criticism.

Design: Using the *Forms of Self-Criticism/Self-Reassuring Scale*, 29 individuals from a total sample of 139 were pre-selected to determine how self-criticism impacts upon an initial instance of imagery.

Methods: All participants took part in three activities: a control imagery intervention (useable data N=25), a standard CFI intervention (useable data N=25) and a non-intervention control (useable data N=24). Physiological measurements (alpha amylase) as well as questionnaire measures of emotional responding (i.e. the Positive and Negative Affect Schedule, the Types of Positive Affect Scale and the State Adult Attachment Scale) were taken before and after the different interventions.

Results: Following *both* imagery interventions, repeated measures analyses revealed that alpha amylase increased significantly for high-self critics compared with low-self critics. High self-critics also reported greater insecurity on entering the imagery session and more negative CFI experiences compared with low self-critics.

Conclusions: Data demonstrate that high self-critics respond negatively to imagery interventions in a single trial. This highlights that imagery focused therapies (e.g.

CFI) need interventions that manage fears, blocks and resistances to the techniques, particularly in high self-critics.

Words: 255

Practictioner Points

- An initial instance of imagery (e.g. CFI) can be frightening for people who have a tendency to be self-critical.
- This research provides examples of physiological and emotional responses to imagery type therapies in high and low self-critics, and associated clinical implications.
- Therapists may find it helpful to be mindful that when introducing imagery based therapies, highly self-critical patients need interventions that manage fears, blocks and resistances to the techniques.

Key words: Imagery, Compassion focused imagery (CFI); Self-criticism; Threat; Alpha-amylase; Well-being, Anxious Responding

Introduction

There is growing evidence that focusing on the cultivation of compassion-based emotions has important effects on mental states and well-being (Hofmann, Grossman & Hinton, 2011), with research demonstrating compassion-focused interventions are effective in clinical populations (Judge, Cleghorn, McEwan & Gilbert, 2012; Mayhew & Gilbert, 2008; Laithwaite et al., 2009; Lucre, 2012). According to Weng et al. (2013) compassion is linked to motives, emotions and competencies to be understanding, supportive, helpful and kind to others. Gilbert (2014) suggests that compassion involves sensitivity to both the *self* and others, and a drive to alleviate suffering in the self and others. Neff (2003) additionally defines self-compassion as "…*experiencing feelings of caring and kindness toward oneself, taking an understanding, non-judgmental attitude toward one's inadequacies and failures, and recognising that one's experience is part of the common human experience*" (p.244).

Building upon the work of LeDoux (1998; see also Depue & Morrone-Strupinsky, 2005), Gilbert (2010) has argued that a tripartite affective system exists, which consists of one negative 'threat-focused' (and limbic centred) affect system and two positive affect systems. Of these two positive systems, one is focused upon stimulation and excitation, and the other upon feeling safe, content and affiliated with others. Compassion, both for the self and others, is argued to be linked to the 'safety and contentment' positive affect system. Supporting research has shown that affiliative social relationships and emotions: calm participants, alter pain thresholds, regulate immune/digestive systems, and operate via the oxytocin-opiate system (Depue & Morrone-Strupinsky, 2005; Insel, 2010). Thus, this positive affect system has been linked to parasympathetic activity (i.e. 'rest and digest'; Porges, 2007), and is proposed

to be important in down-regulating the negative sympathetic threat-seeking system (Depue & Morrone-Strupinsky, 2005; Gilbert, 2014).

It is now recognised that imagery is a powerful way to stimulate physiological and affect (i.e. emotional) systems, and that imagery is important in various forms of structured psychotherapy (Stopa, 2009). Many forms of compassion cultivation training require individuals to *imagine* themselves as compassionate, and/or experiencing compassion from others (Hofmann et al., 2011). In the latter, this is imagining *another sentient mind or person* directing positive, caring and compassionate feelings towards oneself. Gilbert (2010) suggests that such Compassion Focused Imagery (CFI) enhances well-being because it stimulates physiological systems associated with affiliation and wellbeing. CFI may stimulate the safety and contentment affect system, which in turn stimulates oxytocin, endorphin and parasympathetic activity (Gilbert 2014, 2010). Such physiological responses then lead to the down-regulation of stress hormone release (e.g. cortisol and alpha amylase) associated with the threat-focused affect system. That is, CFI allows for a state of quiescence, which is achieved (and maintained) through the 'turning off' of the threat-focused affect system.

Consistent with the idea that compassionate imagery can impact on various physiological and psychological systems, specific CFI (*imagining feeling compassion being directed towards ones' self from an imaginary external source)* has been shown to increase behavioural (Kelly, Zuroff, Foa & Gilbert, 2010) and physiological indices of well-being following CFI imagery (e.g., Longe et al; 2010; Rockliff, Gilbert, McEwan, Lightman & Glover, 2008; Rockliff et al., 2011). Rockliff et al. (2008) found that after engaging in CFI, compared with a control imagery task in which individuals imagined preparing a sandwich, approximately 50% of participants

showed a clear increase in heart rate variability (HRV) as well as a significant decrease in cortisol levels. As increased HRV and lowered cortisol levels are both linked to attenuation of threat-defensive behaviours (the threat-focused affect system) they argue that such results demonstrate CFI stimulates the safety and contentment affect system and consequently increases well-being. More recently, Rockliff et al. (2011) demonstrated that the use of an oxytocin spray, prior to CFI, increases the ease and ability of most individuals to engage in CFI. Given that oxytocin has been found to facilitate a range of affiliative behaviours (Bartz, 2010; see also Insel, 2001; Lee, Macbeth, Pagan & Young, 2009, for reviews), Rockliff et al. argue that this finding again demonstrates that CFI is linked to (brain) circuitry concerned with the safety and contentment affect system, and hence well-being.

However, in both of the above physiological studies, a subset of participants demonstrated a more threat-like response to CFI. That is, post-hoc examination of individual differences revealed those scoring highly on measures of self-criticism demonstrate increased resistance to engage in CFI when given oxytocin (Rockliff et al., 2011); or a *decrease* in HRV (and no change in cortisol) following the actual CFI task (Rockliff et al., 2008). Taken together, these findings suggest that for self-critical individuals, CFI may *activate* rather than deactivate threat systems. This is also consistent with research by Longe et al. (2010), who found that those scoring higher in self-criticism showed increased amygdala activation when attempting to engage in self-reassurance thinking. As the amygdala is implicated in responding to threat (Adolphs 2002; Maratos, Mogg, Bradley, Rippon & Senior, 2009) and a key structure in the 'threat-focused' affect system, this again suggests that self-critical individuals experience difficulties with interventions aimed at positive thinking/imagery.

These findings confirm clinical observations (Gilbert & Irons, 2005), as well as studies of student efforts to generate compassionate images (Gilbert, Baldwin, Irons, Baccus & Palmer, 2006), that self-critical individuals might be fearful of compassion. Indeed some individuals can have difficulties with feelings of contentment, safeness and compassion (Gilbert et al., 2011). This can be for a number of reasons such as physical and psychological abuse/neglect as a child (Gilbert et al., 2012; Gilbert, McEwan, Matos & Rivis, 2012; McEwan et al., 2014). Consequently, such individuals become frightened when compassion focused interventions are introduced. However, a limitation of many previous research studies into compassion and self-criticism (e.g. Longe et al, 2010; Rockliff et al., 2008; Rockliff et al., 2010) is that this variable has been investigated via post-hoc analyses. This is problematic as such methods can result in an undifferentiated sample, which is not representative of clinical populations and often confounded by floor effects.

Given that self-criticism is a major source of vulnerability to psychopathology (Kannan, & Levitt, 2013; Zuroff, Santor, & Mongrain, 2005), and can be a complicating factor in treatment (Bulmash, Harkness, Stewart, & Bagby, 2009; Rector, Bagby, Segal, Joffe & Levitt, 2000), further work is needed on the impact of CFI on threat processing systems in self-critical individuals. A very recent study by Arch et al. (2014) has demonstrated that brief training in self-compassion may protect the self from threats of social evaluation. They found that women trained in self-compassion prior to a stressful social evaluation event, i.e. the Trier Social Stress Test (TSST), demonstrated both diminished sympathetic nervous system activity (as measured by salivary Alpha Amylase (sAA)) and subjective anxiety. Previously, acute psychological stress during the TSST has been associated with increased sAA release (Rohleder, Wolf, Maldonado & Kirschbaum, 2006; Thoma, Kirschbaum, Wolf

& Rohleder, 2012). However, in the Arch et al. study self-criticism was again not assessed.

Thus, the aim of the present study was to further investigate the role of self-criticism in response to imagery, and specifically CFI compared with a control imagery task. We included sAA as our physiological measure of CFI, as a higher sAA response is indicative of a heightened sympathetic (i.e. threat) response (see Nater & Rohdler, 2009 for review) and, as outlined above, sAA has been linked to acute psychological stress. To explore emotional indicators of the imagery tasks, we included state versions of the Positive and Negative Affect Schedule and the Types of Positive Affect Scale, as well as the State Adult Attachment Scale. A measure of state attachment was included given that compassion is linked to the safety and contentment affect system, and a key component of this system is feeling affiliated with others. Finally, whilst building upon the preliminary work of Rockliff et al. (2008; 2011), we utilised a more rigorous design by pre-selecting participants based upon trait self-criticism, and matching the control imagery more carefully to the CFI. Certainly, using a sandwich making imagery task could be problematic in that eating and even imagined eating is associated with fluctuations in hormones (Legler, BrandenBerger, Hietter, Simeoni, & Reinhardt 1982; Schmid et al., 2005).

Considering previous research, we predicted that high, as compared to low, self-critical individuals would demonstrate a threat response to CFI compared with control imagery. That is, we hypothesised that high self-critics (HSC) compared with low self-critics (LSC) would demonstrate increased sAA following the CFI intervention. In addition we hypothesised that, if finding the CFI intervention threatening, HSC would demonstrate negative changes in our emotional indicators.

For example, feeling less positive, secure and/or attached following the CFI session, and/or difficulty engaging in the CFI.

Methods

Design

We employed a mixed measures design, with 'self-criticism' (high vs. low) as the between subjects variable and 'imagery' (**Analysis 1**: control imagery, CFI **Analysis 2**: control imagery, CFI, no-intervention) as the within-subjects variable. We calculated sample size based on the Rockliff et al. (2008) paper, but for this calculation utilised the more complex design (i.e. Analysis 2). To obtain an interaction effect for a two (HSC; LSC) by three (baseline, control imagery, CFI) factorial design with a medium effect size (0.25) and acceptable power (i.e. 0.8; with alpha set at 0.05), the calculated sample size required was 28 (i.e. 14 HSC vs. 14 LSC).

Participants

We employed a stratified sampling procedure to enable us to avoid difficulties associated with post-hoc analysis (and potential floor effects). That is, in a pre-selection process, data pertaining to the Forms of Self-Criticism/Self-Reassuring scale (FSCSR, Gilbert, Clarke, Hempel, Miles & Irons, 2004) were collected from 139 females (mean age = 24.96, SD = 6.49). These were staff and students from a UK University. Based upon our sample size calculation the top 16 and bottom 16 scorers (i.e. those who scored below 15 or above 25 on the self-critical component of the FSCSR; see below measures section), who had no diagnosed mental health issues, were invited

to participate in the full study. Subsequently 29 participants responded and completed the full two-phased study. In both phases (see Figure 1) the groups differed significantly in self-criticism: e.g. with an N=25 mean LSC score = 12.69, mean HSC score = 33.41 (full composite scores can range from 0-35); t (23) = -7.584, $p < 0.001$; but not age (mean LSC age = 24.27 mean HSC age =24.08; p > .95).

All participants gave informed written consent to participate in the study, which received local Ethics Committee approval.

Figure 1 about here

Measures

Alpha amylase measurement

sAA measurement was obtained via saliva samples (Sarstedt Ltd.). At each measurement point participants were asked to rinse their mouths with cold water (3 minutes), and then place rolling cotton under their tongue until saturated (about 3 minutes). All samples were then immediately frozen (at –70 Celsius) before being assayed for alpha-amylase by Obsidian Research Ltd (Port Talbot, UK) using an Enzyme-Linked ImmunoSorbent.

Forms of Self-Criticism/Self-Reassuring Scale (FSCRS) (Gilbert et al., 2004)

This 22-item scale assesses participants' thoughts and feelings about themselves during a perceived failure. Two subscales measure forms of self-criticising (*inadequate self* and *hated self*) and one subscale measures tendencies to be reassuring to the self (*reassured self*). Items are rated on a five-point Likert scale. Normative Cronbach's alphas are .90 for inadequate self, .86 for hated self, and .86

for reassured self. To establish self-criticism level a composite score comprising the inadequate self and hated self-scores was used to divide the sample into high and low self-critics.

State Adult Attachment Scale (SAAS) (Gillath et al., 2009)

This 21-item scale assesses state attachment. The SAAS differentiates between three psychological processes; *anxiety about attachment*, *avoidance of attachment* and *security-based strategies*. Respondents indicate how much they agree or disagree (right now) with each statement on a seven-point Likert scale. Normative Cronbach's alphas range from .82 to .91 for *security*, .81 to .85 for *anxiety* and .71 to .87 for *avoidance.*

Types of Positive Affect Scale (Gilbert et al., 2008)

This 12 item scale measures *activated*, *relaxed* and *secure/safe* positive affect. Participants are asked how characteristic (right now) each affect word is for them on a five-point Likert scale. Normative Cronbach's alphas are .83 for the activated and relaxed subscales and .73 for the safe subscale.

Positive Affect and Negative Affect Schedule (PANAS) (Watson et al., 1988)

This 20-item mood scale provides brief measures of positive and negative affect (10 items each respectively). Respondents rate the extent to which they have experienced each particular emotion within a specific time period (right now), using a five-point Likert scale. Normative Cronbach's alphas range from .86 to .90 for the *positive affect* scale, and .84 to .87 for the *negative affect* scale.

General Procedure

All experimental sessions were conducted between 2 PM and 7 PM, to control for circadian oscillations of alpha-amylase (Rohleder & Nater, 2009). Before each testing session participants were asked to refrain from a number of behaviours prior to the experimental sessions, these included: excessive physical activity for the preceding 48 hour period; sporting activities for the preceding 24 hours; alcohol intake for the preceding 18 hour period; glucose/caffeine intake and chewing gum on the day of the study; and tooth-brushing, eating or drinking (except water) for the preceding 60 minute period. These exclusion criteria were designed to reduce confounding factors shown to affect physiological dependent measures (Nater, Rohleder, Schlotz, Ehlert & Kirschbaum, 2007). Data for the non-intervention control was collected 7 days prior to, or after, the imagery intervention (counter-balanced across participants) and always at the same time of day. For each of these differing phases the exact procedure is described below.

Imagery Interventions

The imagery interventions consisted of three phases. In phase 1, participants signed the consent forms then completed the three emotional indicator questionnaires (e.g. the SAAS, TPAS, PANAS). Mid-way through this first phase (approximately 7.5 minutes into phase one), the first sAA measurement was taken (i.e. the participants 'baseline' level). In phase 2 participants completed the first imagery task (either the compassion focused imagery task or the control imagery task counter-balanced across participants). Phase 2 consisted of the task explanation (5 minutes), followed by the actual imagery exercise (7 minutes). After this series of events the second sAA measurement was taken, followed by the state measure questionnaires again. In phase

3, participants undertook the second imagery task. Phase 3 consisted of the task explanation (5 minutes) followed by the actual imagery exercise (7 minutes). After this series of events the third sAA measurement was taken, which was again followed by the state measure questionnaires. Note that in phase 2 and phase 3 as the order of imagery task was counter-balanced across individuals 50% of participants (i.e. 50% HSC; 50% LSC) completed the CFI task first and 50% of participants completed the control imagery task first.

Compassion Focused Imagery (CFI) Task

In the CFI condition participants listened to a recorded outline of the imagery task, a definition of compassion, an explanation of what was meant by "mental imagery," and advice on how to deal with one's mind wandering (i.e., not to worry, but simply guide one's mind back to the imagery). The CFI involved participants generating visual images of a deeply compassionate person/being. Using a standard recording, the participants were asked to imagine being the recipient of compassion and feelings of warmth, understanding, and care, emanating from this image to them. The recording guided each participant through the CFI, with verbal prompts at 45-second intervals, focusing on compassionate qualities - e.g., "*focus on the wisdom and understanding that is there for you; imagine being understood and completely accepted; focus on the great warmth and kindness that permeates the whole image and is directed at you*". Transcripts and imagery instructions were the same as that used by Rockliff et al., (2011).

After this condition, as with Rockliff et al. (2011), an after CFI (CFI Task Ease) questionnaire was included. This contained eight quantitative questions (in which participants rated their experiences of CFI on a 1-10 scale) tailored to the

ability to generate a compassionate image, and two qualitative questions (where participants wrote about their actual CFI experiences).

Control Imagery Task

In the control imagery condition a similar procedure was adopted but with the exception that the recorded imagery task involved a scenario where individuals were asked to engage in imagery concerned with taking a stroll through the countryside/some woods. Importantly, this imagery task was matched to the CFI task on a number of key variables. It was of the same length as the CFI task, contained the same number of verbal prompts at similar time intervals, and used the same actress as in the CFI audio recording.

The use of this task was to ensure that participants engaged in a similar type of intervention (i.e. imagery) of matched duration, but one that was not associated with any particular physiological responses, nor any particular emotions.

No-Intervention Control

To investigate the influence of diurnal changes in sAA as well as any chronic or general situational influences (e.g. taking part in laboratory testing *per se*), in a second testing session seven days apart, the same participants took part in a non-intervention control where they simply held a bean-bag (non-emotional haptic control) in their dominant hand for a period of 7 minutes. To ensure parity between the two testing sessions participants again completed the consent and questionnaire measures.

Data Screening

For the 26 participants with complete data sets during the imagery intervention phase, sAA data from one participant was identified as an outlier according to their z-scores (i.e. a score of above 3 in all conditions). Following removal of this participant, data were analysed for normality of distribution using skewness and kurtosis scores. These analyses revealed the sAA values to be normally distributed across the remaining participants (N = 25). For the 24 participants with complete data sets for both the imagery and control non-intervention phases, the descriptive statistics again revealed sAA values to be normally distributed across participants.

Results

Effects of Self-criticism & Imagery Interventions on Alpha Amylase

To accurately analyse the sAA response, we computed delta scores between the post-intervention and baseline phase as recommended by Rohleder & Nater (2009). These delta (change) scores are presented in Figure 2a. A mixed measures ANOVA with level of self-criticism (high, low) as the between-subjects IV and imagery delta score (control imagery, CFI) as the within-subjects IV revealed a main effect of self-criticism only (f (1, 23) = 6.602, p = 0.017**,** np^2 = 0.223) whereby sAA increase was significantly greater for the HSC compared with the LSC following both imagery interventions.

Figure 2 and Table 1 about here

Effects of other factors on Alpha Amylase

To investigate any mediating influences of diurnal, general or chronic changes on the sAA response we further computed the delta score for our no-intervention control (see Figure 2b; Table 1) and entered this into a three (control imagery; CFI, no-intervention) by two (HSF; LSC) mixed measures ANOVA. As for this analysis Mauchly's test of Sphericity was violated we applied a Greenhouse-Geisser correction. Importantly, whilst this analysis revealed no main effects of condition (f (1.460, 44) = 1.194, p > 0.3**,** np2 = 0.051) or level of self-criticism (f (1, 22) = 3.530, p = 0.074**,** np2 = 0.138), a significant condition by self-criticism interaction was observed (f (1.460, 44) = 4.249, p = 0.034**,** np2 = 0.162). To clarify the latter, a two-tailed between subjects t-test was undertaken separately for each condition, with level of self-criticism as the independent variable. These analyses revealed significant differences in sAA levels for the HSC as compared to the LSC in both the control and CFI interventions (t(10.57) = -2.162, p=0.05 & t(15.612) = -2.176, p = 0.05, respectively), but not the no-intervention control (p > 0.55). Thus in our non-imagery intervention self-criticism did not influence sAA levels.

Finally, for the imagery interventions, we also explored whether condition order (whether participants took part in the CFI or control imagery task first) had an effect on alpha amylase value. Here, a mixed measures ANOVA with alpha amylase (within-subjects factor) and condition order (between-subjects factor) revealed no significant effects of condition order (p > .65).

Effects of Self-Criticism & Imagery Condition on Emotional Indicators

To assess whether level of self-criticism influenced changes in our state measures during the imagery interventions (i.e. on entering the session or 'baseline' vs. immediately post the imagery intervention), a repeated MANOVA was conducted

with level of self-criticism (low or high) as the between-subjects variable and PANAS, TPAS & SAAM subscale measures during each condition (baseline, CFI, control imagery) as the within-subjects variables. Results revealed a significant interaction effect between level of self-criticism and the TPAS 'safeness' subscale (f (2,46) = 3.23, p = .049, np2 = .123). These effects are displayed in Figure 3. For the self-criticism and TPAS 'safeness' interaction, safeness increased significantly from baseline to control imagery (f (1,23) = 8.57, p = .008, np2 = .272), but not baseline to CFI (p > .20). An independent measures t test revealed that this imagery interaction was driven by the HSC, whereby these individuals demonstrated significantly lower baseline scores of safeness (t= 4.11 (23), p < .001). That is, on entering the imagery session, the HSC felt less safe than the LSC.

To investigate the significant self-criticism x TPAS 'safeness' interaction *within* participants, two repeated measures ANOVAs of condition (baseline, CFI, control imagery) were undertaken separately for the HSC and LSC individuals. These analyses revealed a main effect of condition type for the HSC individuals only (f (2, 20) 4.631 p = .022, np2 = .317). Pair-wise Bonferroni corrected comparisons revealed that for the HSC individuals TPAS safeness increased significantly following control imagery as compared with baseline (p = .007), but not following CFI as compared with baseline (p = .083).

Figure 3 about here

Effects of other factors on Emotional Indicators

To investigate any mediating influences on the TPAS Safeness subscale, we also compared TPAS Safeness scores at baseline with TPAS scores following the no-

intervention control as a function of self-criticism (i.e. HSC; LSC). Whilst there were significant main effects of condition (f (1, 25) = 5.588, p = 0.026**,** np2 = 0.183), and self-criticism (f (1, 25) = 5.78, p = 0.024**,** np2 = 0.188), there was not a significant self-criticism by condition interaction (p > .10). For the main effect of condition, higher scores of safeness were reported after the no-intervention control condition compared with baseline across all participants. For the main effect of self-criticism, HSC demonstrated lower safeness scores *per se*.

Self-Criticism & CFI Task Ease

In a final analysis we investigated the ease at which HSC and LSC were able to engage in the CFI intervention. We found that HSC reported more resistance to feeling compassionate emotions compared to LSC (t(26) = -2.17, p = .038) and also more difficulty imagining the compassionate image having positive characteristics (t(26) = 3.17, p = .004). HSC further described the experience as more negative than LSC. For example, HSC reports included statements such *as 'I felt miserable, upset …I've experienced it as negative emotions', 'I felt the exercise difficult to do …I felt sad after'*, whereas LSC reports included statements such as *'…It was pleasurable and happy as well as comforting', 'I felt protected and secure', 'Felt very calm, relaxed … it was easy to do the exercise'*.

Discussion

This study used both physiological (alpha amylase) and emotional indicators of well-being, to investigate the effects of self-criticism on Compassion Focused Imagery (CFI) compared with a control imagery intervention. It was hypothesised that high self-critics (HSC) compared with low self-critics (LSC) would demonstrate an

increase in sAA following the single CFI intervention and, in addition, that such individuals would experience CFI as negative and/or threatening as represented by a negative change in our emotional indicators. Results demonstrated that those reporting high, compared with low, levels of self-criticism displayed a greater increase in the stress hormone alpha amylase following *both* the imagery interventions (i.e. CFI and the control imagery task), but no difference in alpha amylase following a non-intervention control. In addition, it was found that the degree of self-criticism influenced responses on the Types of Positive Affect Scale (TPAS) 'safeness' sub-scale, with those reporting high levels of self-criticism feeling significantly more unsafe/insecure on entering either imagery intervention session. However, following the control imagery intervention, HSC TPAS 'safeness' scores increased significantly. Finally, in relation to our CFI intervention specifically, HSC reported more difficulty and negativity following the CFI intervention compared with those reporting lower levels. Findings will now be discussed in turn, focusing firstly on the predicted CFI results and secondly, the unpredicted control imagery results.

The finding that individuals' reporting high levels of self-criticism demonstrated increased levels of the hormone alpha amylase (sAA) following the CFI intervention is consistent with previous research suggesting that, in its initial instance, CFI is associated with a threat-like response in individuals reporting higher levels of self-criticism (see also Longe et al. 2010; Rockliff et al. 2011; 2008). sAA levels are a reliable marker of psychological stress and the sympathetic nervous system stress response (Arch et al., 2014; Nater & Rohdler, 2009), with elevated levels observed when individuals encounter a number of stressful situations; e.g. the Trier Social Stress Test (e.g. Rohleder, Wolf, Maldonado & Kirschbaum, 2006; Thoma, Kirschbaum, Wolf & Rohleder, 2012). In line with these studies it can be argued that

for our highly self-critical individuals, the initial experience of CFI was distressing. This is congruent with the written reports of the CFI experience participants gave. Namely, those who were highly self-critical reported the CFI experience as more threatening, and had more difficulty generating an image with positive characteristics. This latter finding is similar to Gilbert et al. (2006) who explored students ability to generate critical or compassionate images following an imagined 'less than wanted grade' on a coursework piece. They also found that higher self-criticism was associated with greater difficulties in generating compassionate images but ease in generating critical ones; with lower self-critics showing the reverse. Our results further fit with clinical observations, where self-critical individuals and those scoring low in social safeness, find focusing on compassion difficult, threatening and even unsafe in the first instance (Gilbert & Irons, 2005). Indeed Gilbert et al. (2012) have found that some individuals can be fearful of compassion.

Gilbert & Procter (2006) argue that heightened sensitivity and over activity of the threat-protection system is a common problem in individuals with high self-criticism. These individuals can find it difficult to feel content and safe within themselves and in interpersonal relationships, suggesting that the safety/contentment affect system is insufficiently accessible to them. This is consistent with the current finding that those self-reporting as high in self-criticism displayed significantly lower scores on the TPAS safe/content sub-scale at baseline. That is, HSC demonstrated a lower sense of security (feeling safe and content), on entering the imagery sessions.

The current results, nonetheless, must be tempered with the unexpected findings that the HSC also demonstrated increased sAA levels following the *control* imagery intervention (cf. Rockliff et al., 2008). Taken together these results may imply that highly self-critical individuals find a range of scenarios and requested tasks

threatening – whether therapeutic or otherwise. For instance it may be the novelty value, or 'task expectation concerns', that self-critical participants find threatening. Alternatively, it could be that high self-critics over-monitor performance as they fear doing things incorrectly; especially when measures are being taken and they feel their 'performance' is being evaluated. This monitoring of mistakes and heightened anxiety would adversely impact upon *any* novel (imagery) task regardless of the actual specifics. It could further explain why for the control imagery intervention safeness increased significantly following the intervention. As the control imagery was designed not to evoke any specific emotions and did not involve a scenario of potential personal threat to the HSC (i.e. simply imagining taking a stroll in the countryside), anxiety was potentially alleviated quite quickly on cessation of the control imagery task. A limitation of the present study, however, was our failure to perform a manipulation check for the control imagery intervention. This would have been useful in assessing emotional indicators of well-being (e.g. imagery ease, imagery resistance) following this condition in comparison to the CFI condition.

Leading on from this, in future research, it is important to investigate physiological stress responses to a range of therapeutic and non-therapeutic practices, as well as ensure that written and/or verbal reports are taken to corroborate physiological data (or otherwise). For example, it could be that findings suggesting the benefits of practicing compassion out-weigh any initial distress it causes (particularly in high self-critics; e.g. Kelly et al. (2010)), simply reflect the repeated practice effects of the intervention (i.e. reduced task expectancy anxiety) and not the affiliative aspect of the CFI. Additionally and where possible, larger sample sizes should be sought as although the present study was adequately powered to detect

changes in our physiological measures, it is difficult to interpret the TPAS data for our HSC following the CFI intervention.

Finally, two further findings are that imagery condition order did not mediate sAA results, and when participants took part in a non-intervention control on a different day, no differences in sAA between the high and low self-critics were returned. Taken together, these findings suggest that results did not reflect random or diurnal changes in sAA as a consequence of circadian rhythms or the testing paradigms (e.g. laboratory set-up *per se*).

To conclude, although previous studies have investigated the effects of self-criticism on responses to CFI (Kelly et al., 2010; Rockliff et al., 2011, 2008; Longe et al., 2010), none of these studies employed stratified sampling procedures to allocate equal numbers of low and high self-critics to the different study conditions. Our study is therefore the first to use stratified sampling to investigate *a-priori* the effects of self-criticism on abilities to engage with (compassionate) imagery, with a population with high (i.e. potentially comparable to clinical) levels of self-criticism. It is also the first to assess sAA responses to differing imagery tasks. The findings that those high in self-criticism when engaged in the CFI showed: i) negative (i.e. threat indicative) physiological responses; *and* ii) fewer positive emotional indicators, has important clinical implications for the use of any imagery-focused psychological interventions. Thus, a key future direction is for clinicians to recognise, manage and utilise different strategies to work with this initial negativity. As we observed no differences in sAA following a haptic control condition between the low and high self-critics this may be an avenue worth exploring further. Certainly, in previous research, Gilbert & Procter (2006) have used tennis-balls as a tactile focus during CFI therapy. Here patients not

only reported that this was helpful, but, moreover, the tennis-balls became associated with self-soothing practices.

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Figures:

Figure 1: A flow diagram representing the selection and allocation of participants to conditions

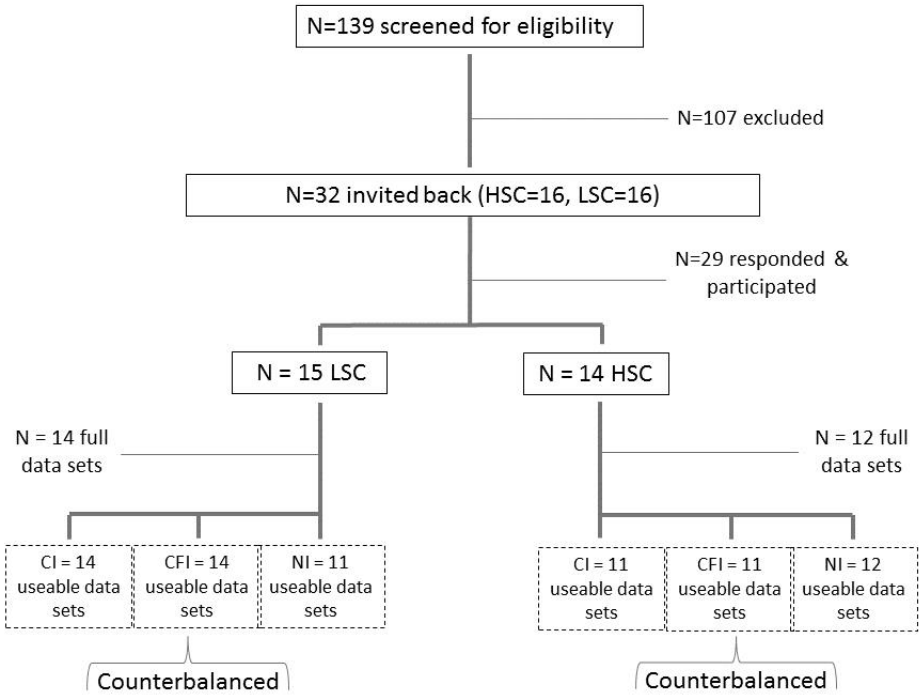


Figure 2: (a) Alpha Amylase Delta Scores as a function of Imagery Intervention and Self-criticism Level. **(b)** Alpha Amylase Delta Scores as a function of Self-criticism Level during a Non-intervention Control on a different day.

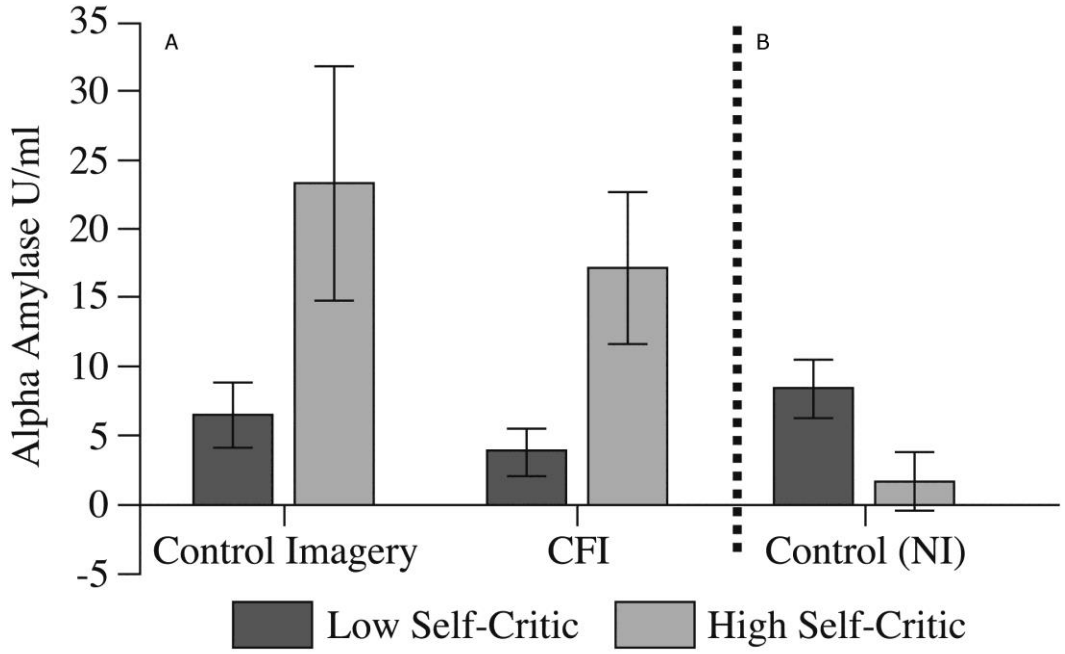
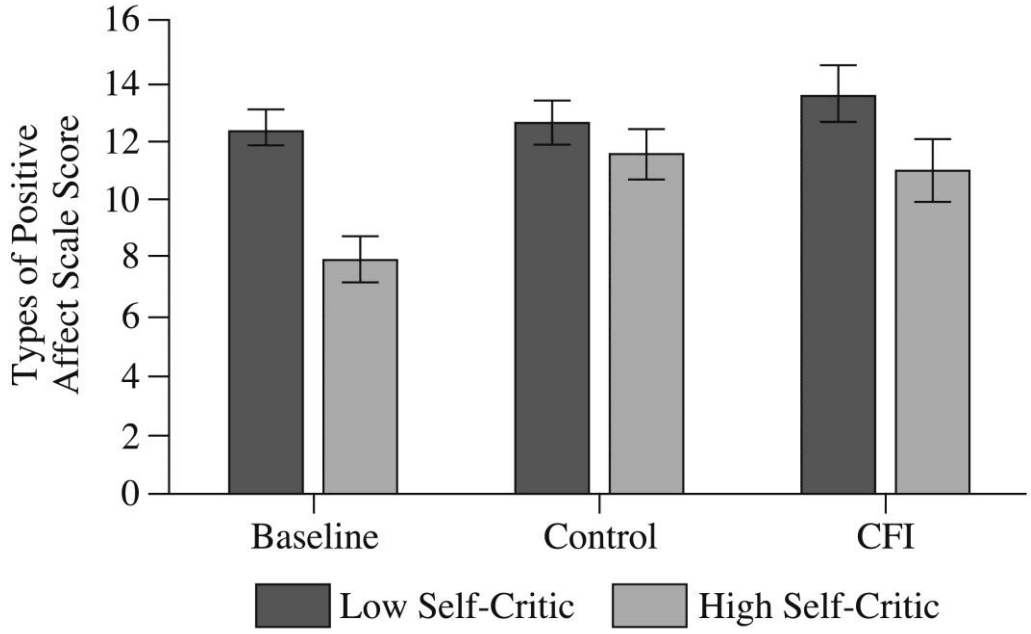


Figure 3: Change in TPAS Safeness as a function of Condition and Self-criticism Level. Scores on this subscale can range from 0-16.



	Condition	**Control Imagery (n=25)**	**CFI (n=25)**	**No-Intervention (n=24)**
Level of Self-Criticism	**Low**	6.34 (5.31)	3.64 (3.55)	8.33 (4.16)
	High	23.33 (5.99)	17.09 (4.00)	1.53 (4.12)
Analyses Results	**Post-Hocs (N=24)**	P=0.05	P=0.05	P>0.55

Table 1: Statistics (including Standard Error) for Alpha Amylase Delta Scores as a Function of Self-Criticism and Condition